AMENDMENTS TO CLAIMS

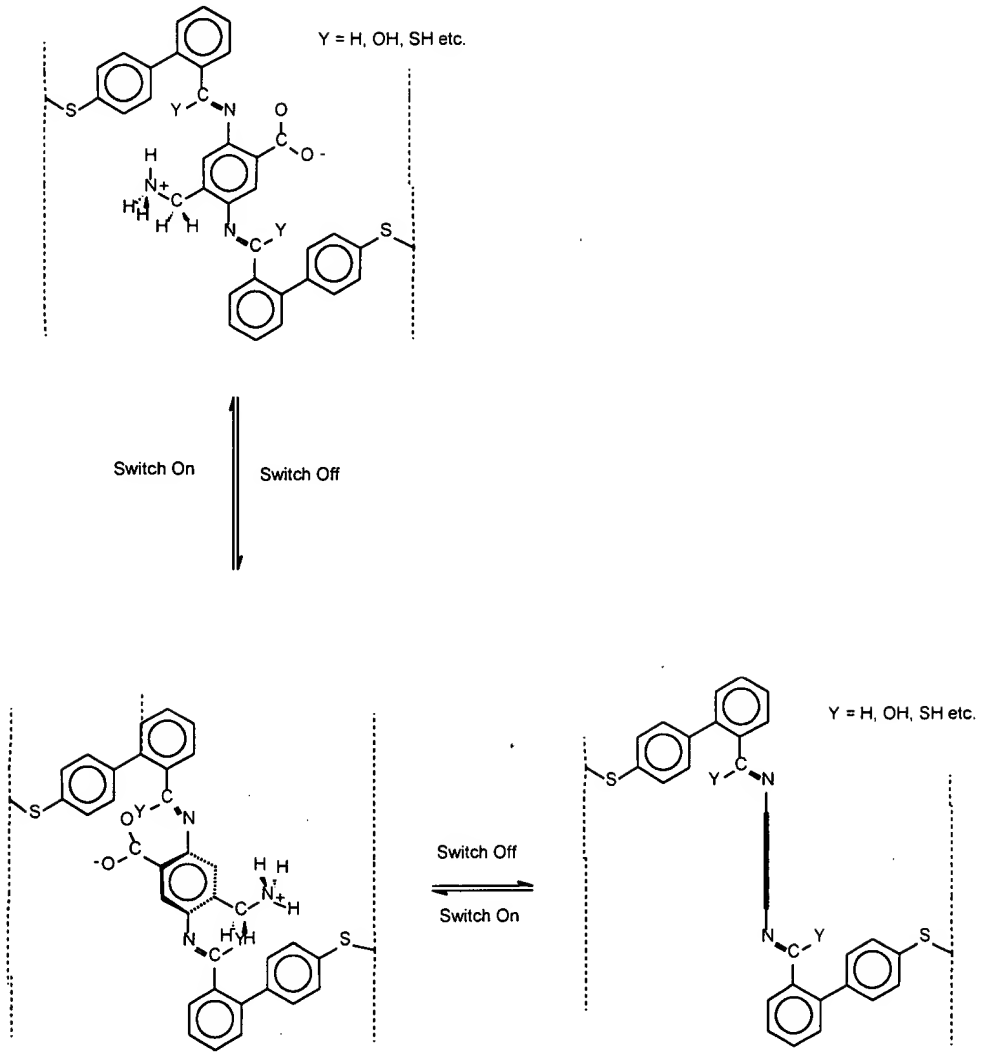
Below is a listing of all claims presently in the application, wherein Claims 1 and 21 are amended:

1. (currently amended) An electric field activated molecular switch comprising a molecular system that has an electric field induced non-redox type of band gap change resulting from [[a]] an intramolecular change in conjugation as p,π-electrons of the molecular system, through its highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO), are alternately localized and delocalized over the entire molecular system by an applied electric field.

2. (original) The molecular switch of Claim 1 wherein said electric field induced band gap change occurs via molecular conformation change or an isomerization.

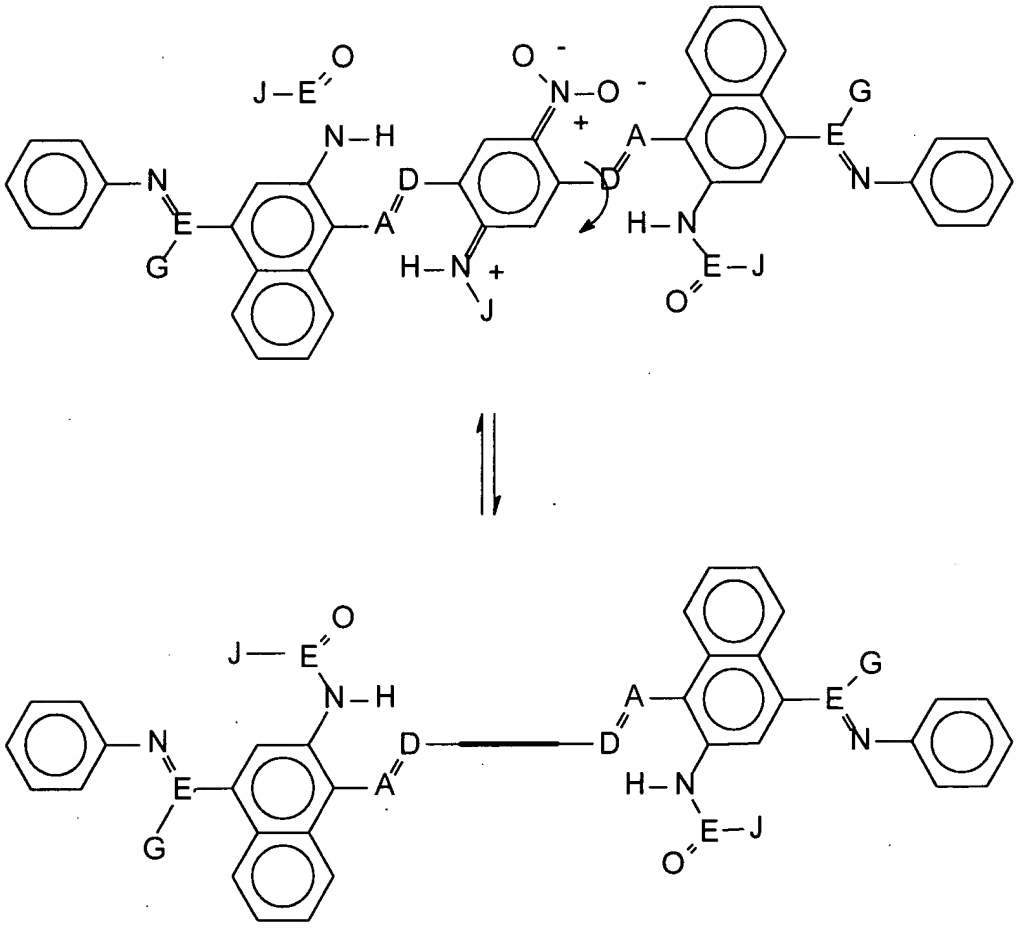
3. (previously presented) The molecular switch of Claim 2 wherein said molecular system comprises at least one stator portion and at least one rotor portion, wherein said rotor rotates from a first state to a second state with an applied electric field, wherein in said first state, there is extended conjugation throughout said molecular system, resulting in a relatively smaller band gap, and wherein in said second state, said extended conjugation is changed, resulting in a relatively larger band gap.

4. (original) The molecular switch of Claim 3 wherein said molecular system comprises:



where the vertical dashed lines represent electrodes to which said molecule is electrically attached.

5. (original) The molecular switch of Claim 3 wherein said molecular system comprises:



wherein the letters A, D, E, G, and J indicate sites where different chemical units can be utilized to adjust geometrical structure and optical properties of said molecular system and have generic designations as follows: A, D, E, G, and J are independently selected from the group consisting of heteroatoms, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom, and where in addition to the foregoing, the letters G and J are independently selected from the group consisting of hydrogen, F, Cl, Br, and I.

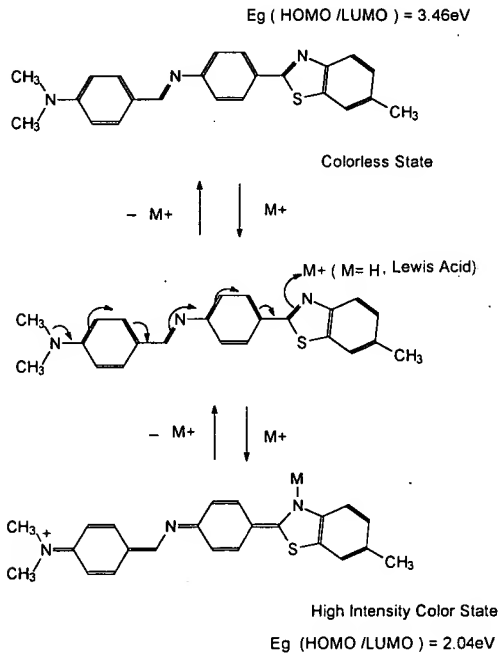
6. (original) The molecular switch of Claim 1 wherein said electric field induced band gap occurs via a change of extended conjugation via chemical bonding change to change the band gap.

7. (original) The molecular switch of Claim 6 wherein said electric field induced band gap change occurs via a change of extended conjugation via charge separation or recombination accompanied by increasing or decreasing band localization.

8. (original) The molecular switch of Claim 7 wherein said molecular system comprises two portions, wherein a change from a first state to a second state occurs with an applied electric field, said change involving charge separation in changing from said first state to said second state, thereby resulting in a relatively larger band gap state, with less π-delocalization, and recombination of charge in changing from said second state to said first state, thereby resulting in a relatively smaller band gap state, with greater π-delocalization.

9. (original) The molecular switch of Claim 8 wherein said molecular system comprises:

10. (original) The molecular switch of Claim 8 wherein said molecular system comprises:



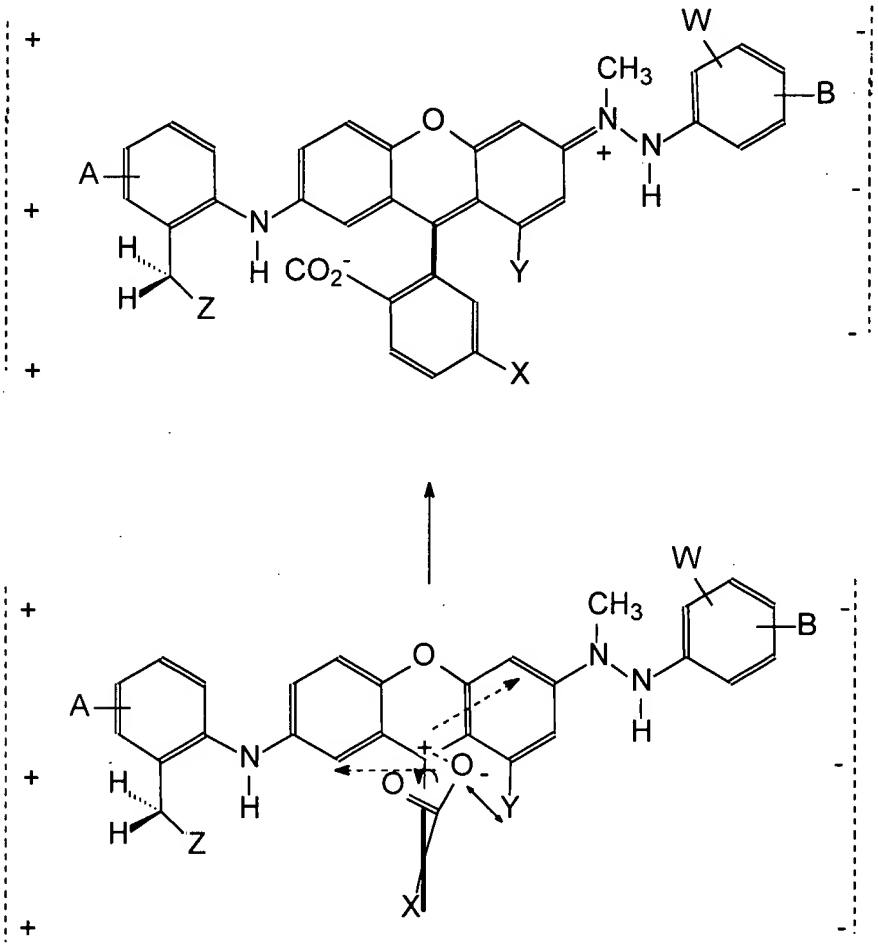
where M^+ represents metals, including transition metals, or their halogen complexes or H^+ or other type of Lewis acid(s).

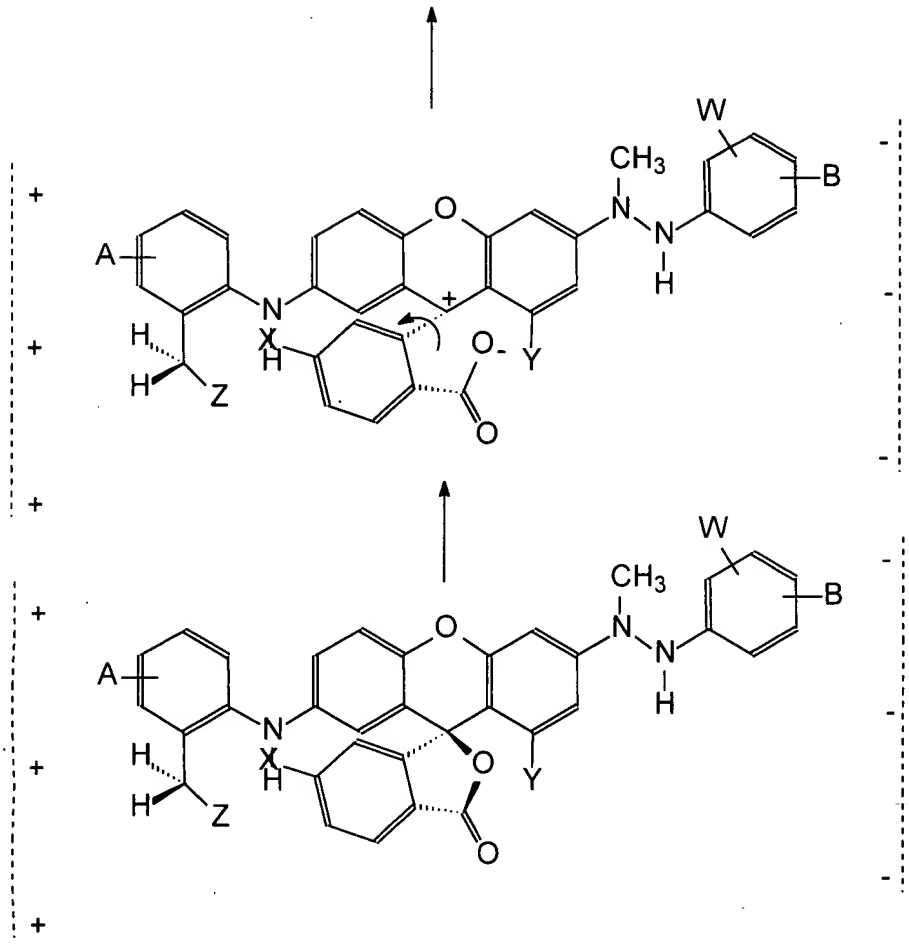
11. (original) The molecular switch of Claim 6 wherein said electric field induced band gap occurs via a change of extended conjugation via charge separation or recombination and π-bond breaking or formation.

12. (previously presented) The molecular switch of Claim 11 wherein said molecular system comprises two portions, wherein a change from a first state to a second state occurs with an applied electric field, said change involving charge separation in changing from said first state to said second state, wherein in said first state, there is extended conjugation throughout said molecular system, resulting in a relatively larger band gap state, and wherein in said second state, said extended

conjugation is changed and separated positive and negative charges are created within said molecular system, resulting in a relatively smaller band gap state.

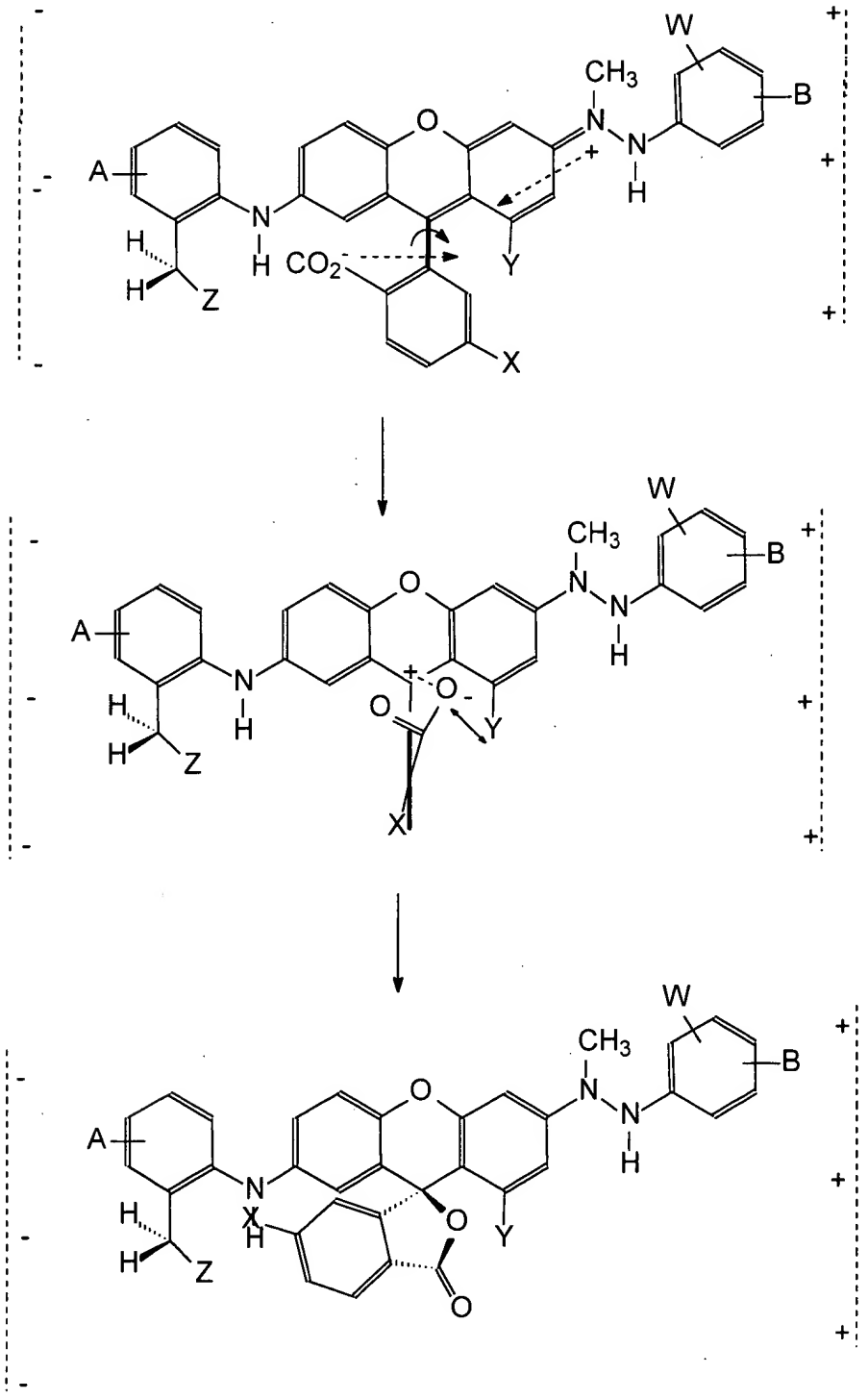
13. (original) The molecular switch of Claim 12 wherein said molecular system comprises:





wherein A, B, W, X, Y, and Z are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom and the vertical dashed lines represent electrodes with which said molecular system is electrically associated.

14. (original) The molecular switch of Claim 12 wherein said molecular system comprises:



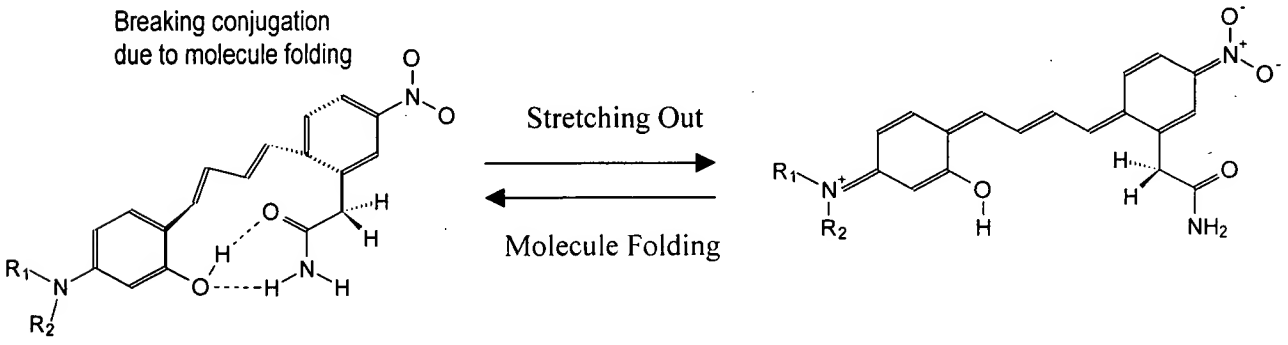
wherein A, B, W, X, Y, and Z are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said

heteroatom and the vertical dashed lines represent electrodes with which said molecular system is electrically associated.

15. (original) The molecular switch of Claim 1 wherein said electric field induced band gap change occurs via molecular folding or stretching.

16. (previously presented) The molecular switch of Claim 15 wherein said molecular system comprises three portions, a first portion and a third portion, each bonded to a second, central portion, wherein a change from a first state to a second state occurs with an applied electric field, said change involving a folding or stretching about or of said second portion, wherein in said first state, there is extended conjugation throughout said molecular system, resulting in a relatively smaller band gap state, and wherein in said second state, said extended conjugation is changed, resulting in a relatively larger band gap.

17. (original) The molecular switch of Claim 16 wherein said molecular system comprises:



wherein R_1 and R_2 are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom.

18. (original) The molecular switch of Claim 1 comprising a crossed-wire device comprising a pair of crossed wires that form a junction where one wire crosses another at an angle other than zero degrees and at least one connector species connecting said pair of crossed wires in said junction, said junction having a functional dimension in nanometers, wherein said at least one connector species comprises said molecular system.

19. (original) The molecular switch of Claim 18 wherein said crossed-wire device is selected from the group consisting of memories, logic devices, multiplexers, demultiplexers, configurable interconnects for integrated circuits, field-programmable gate arrays (FGPAs), cross-bar switches, and communication devices.

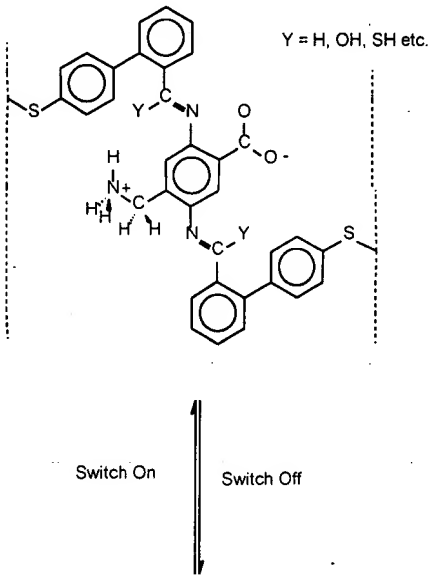
20. (original) The molecular switch of Claim 1 wherein said molecular system is sandwiched between a pair of electrodes and connected thereto by linking moieties.

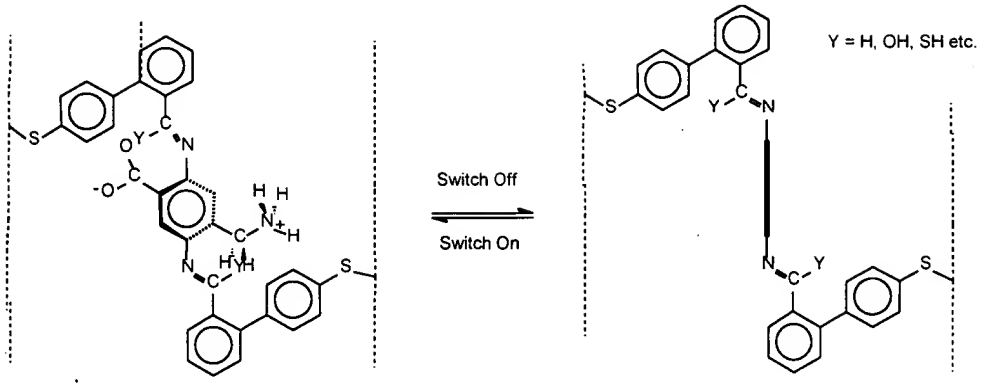
21. (currently amended) A method of electrically switching between two different states in an electric field activated molecular switch comprising a crossed-wire device comprising at least one pair of crossed wires that form a junction where one wire crosses another at an angle other than zero degrees and at least one connector species connecting the pair of crossed wires in the junction, wherein the junction has a functional dimension in nanometers and wherein the connector species comprises a molecular system that has an electric field induced non-redox type of band gap change resulting from [[a]] an intramolecular change in conjugation as p,π-electrons of the molecular system, through its highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO), are alternately localized and delocalized over the entire molecular system by the electric field, said method comprising applying a voltage to a pair of wires to cause a change in the state of said molecular system at said junction thereof.

22. (previously presented) The method of Claim 21 wherein said electric field induced band gap change occurs via molecular conformation change or an isomerization.

23. (previously presented) The method of Claim 22 wherein said molecular system comprises at least one stator portion and at least one rotor portion, wherein said rotor rotates from a first state to a second state with an applied electric field, wherein in said first state, there is extended conjugation throughout said molecular system, resulting in a relatively smaller band gap, and wherein in said second state, said extended conjugation is changed, resulting in a relatively larger band gap.

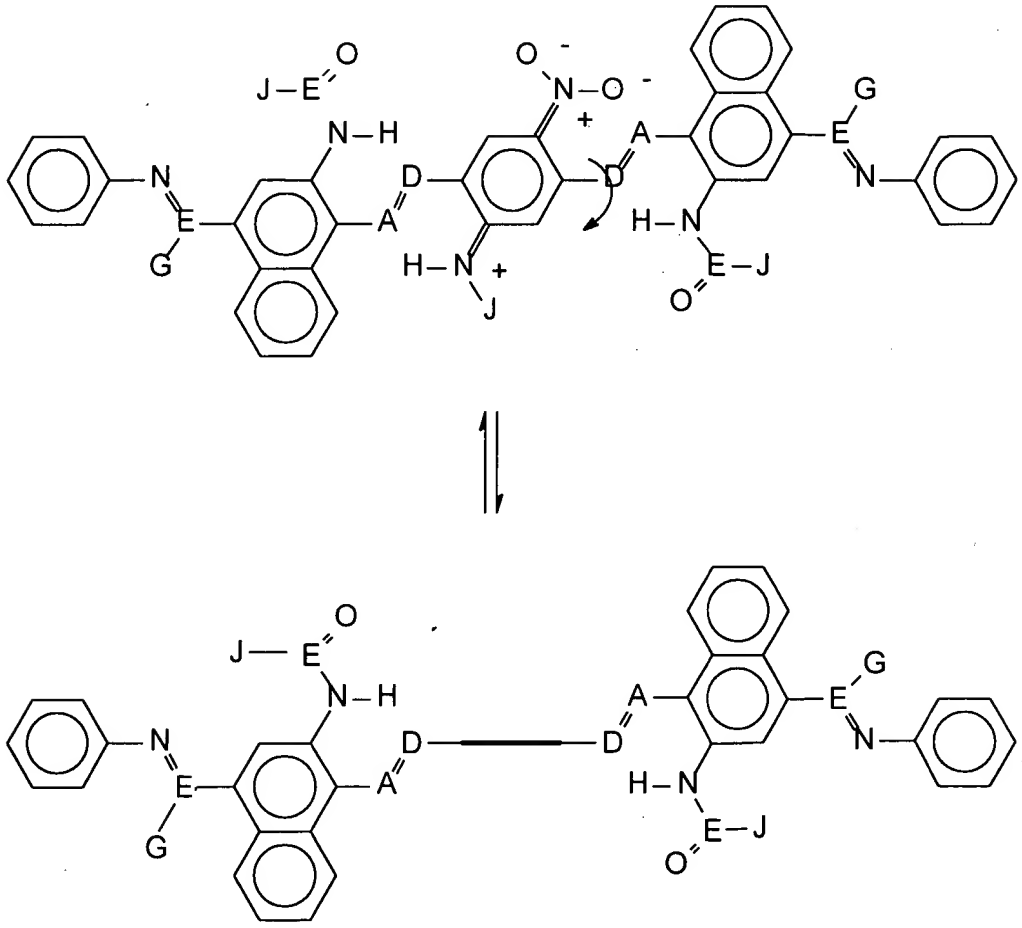
24. (previously presented) The method of Claim 23 wherein said molecular system comprises:





where the vertical dashed lines represent electrodes to which said molecule is electrically attached.

25. (previously presented) The method of Claim 23 wherein said molecular system comprises:



wherein the letters A, D, E, G, and J indicate sites where different chemical units can be utilized to adjust geometrical structure and optical properties of said molecular system and have generic designations as follows: A, D, E, G, and J are independently selected from the group consisting of heteroatoms, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom, and where in addition to the foregoing, the letters G and J are independently selected from the group consisting of hydrogen, F, Cl, Br, and I.

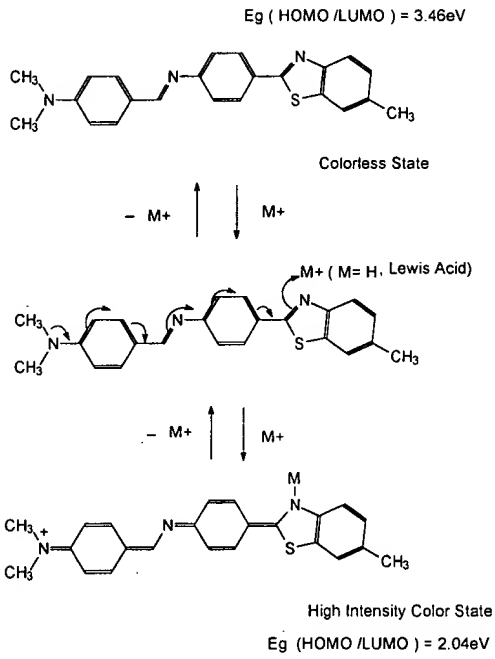
26. (previously presented) The method of Claim 21 wherein said electric field induced band gap occurs via a change of extended conjugation via chemical bonding change to change the band gap.

27. (previously presented) The method of Claim 26 wherein said electric field induced band gap change occurs via a change of extended conjugation via charge separation or recombination accompanied by increasing or decreasing band localization.

28. (previously presented) The method of Claim 27 wherein said molecular system comprises two portions, wherein a change from a first state to a second state occurs with an applied electric field, said change involving charge separation in changing from said first state to said second state, thereby resulting in a relatively larger band gap state, with less π-delocalization, and recombination of charge in changing from said second state to said first state, thereby resulting in a relatively smaller band gap state, with greater π-delocalization.

29. (previously presented) The method of Claim 28 wherein said molecular system comprises:

30. (previously presented) The method of Claim 28 wherein said molecular system comprises:



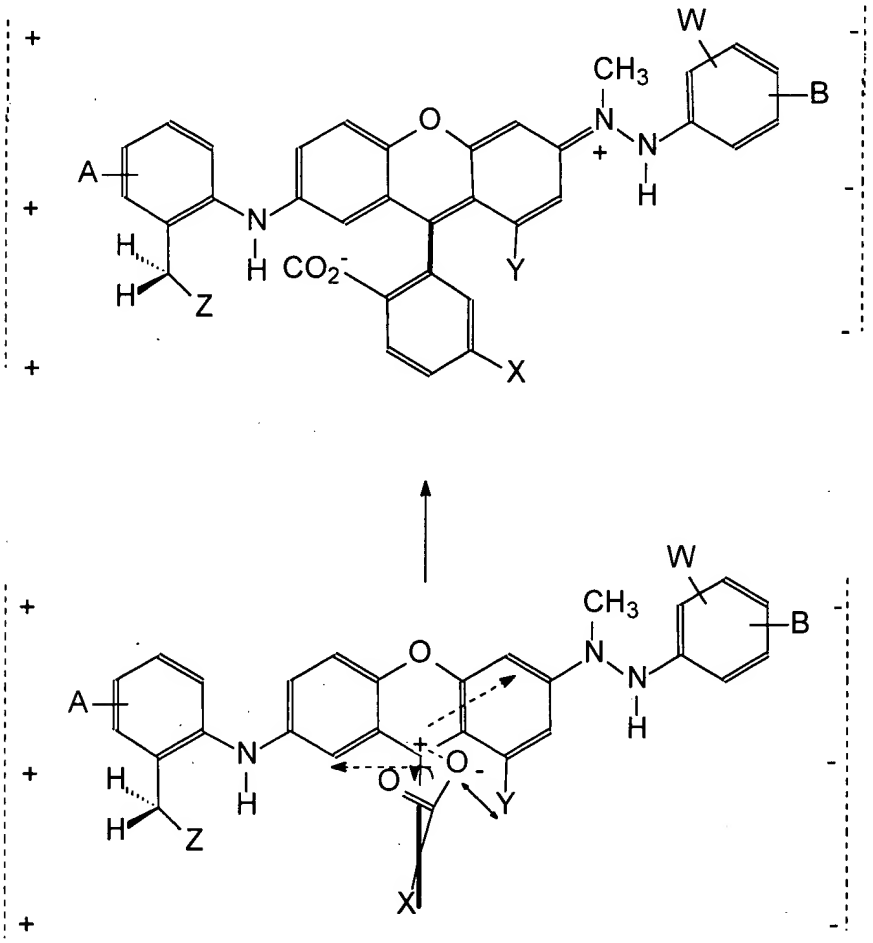
where M^+ represents metals, including transition metals, or their halogen complexes or H^+ or other type of Lewis acid(s).

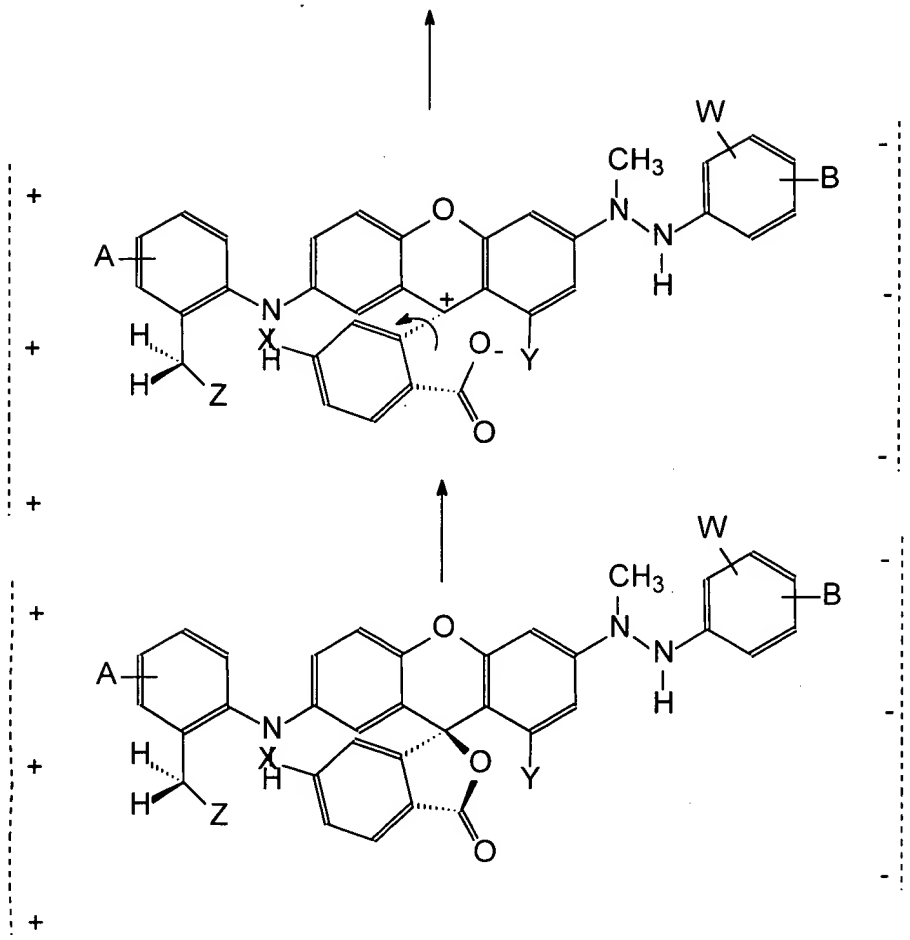
31. (previously presented) The method of Claim 26 wherein said electric field induced band gap occurs via a change of extended conjugation via charge separation or recombination and π-bond breaking or formation.

32. (previously presented) The method of Claim 31 wherein said molecular system comprises two portions, wherein a change from a first state to a second state occurs with an applied electric field, said change involving charge separation in changing from said first state to said second state, wherein in said first state, there is

extended conjugation throughout said molecular system, resulting in a relatively larger band gap state, and wherein in said second state, said extended conjugation is changed and separated positive and negative charges are created within said molecular system, resulting in a relatively smaller band gap state.

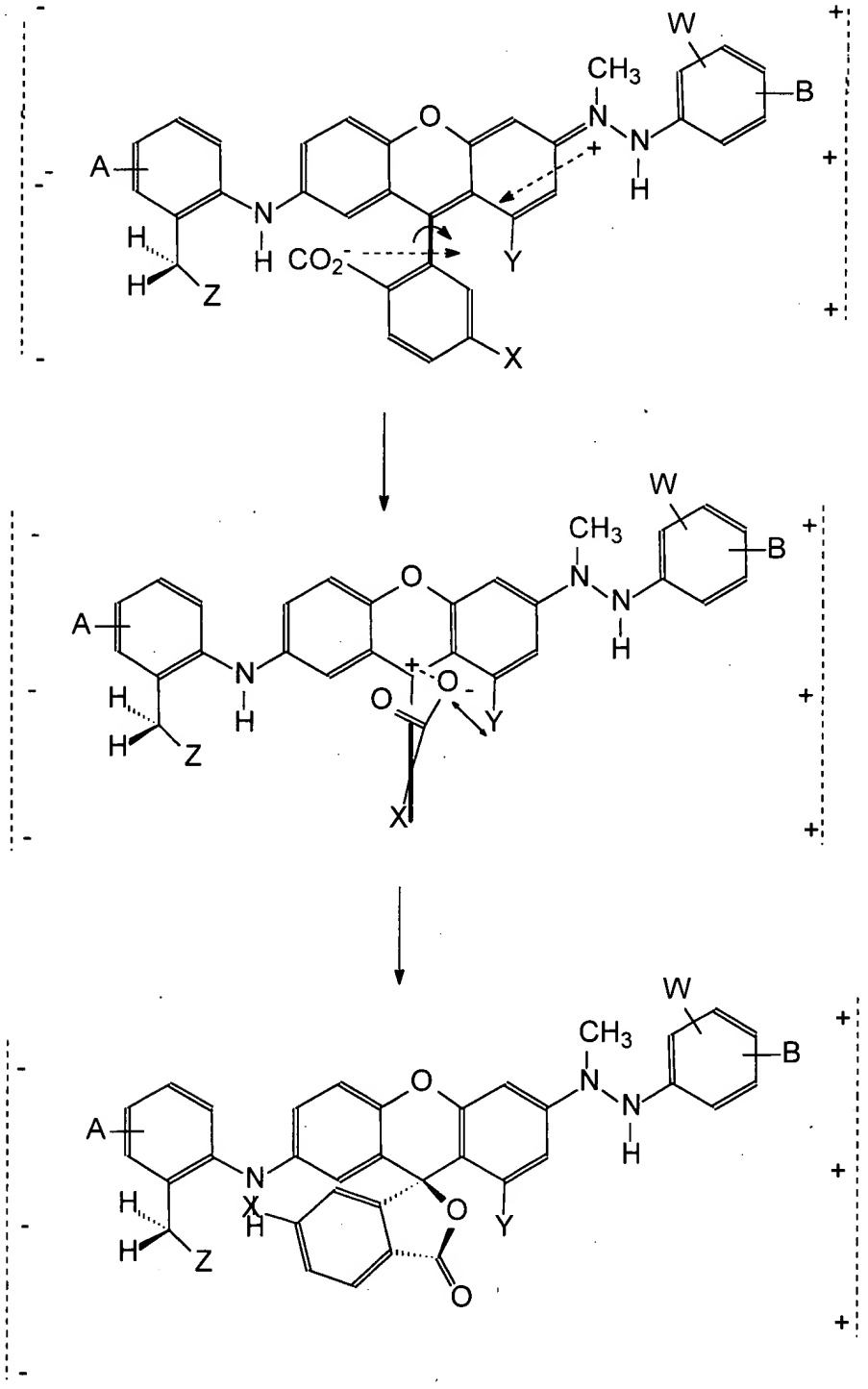
33. (previously presented) The method of Claim 32 wherein said molecular system comprises:





wherein A, B, W, X, Y, and Z are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom and the vertical dashed lines represent electrodes with which said molecular system is electrically associated.

34. (previously presented) The method of Claim 32 wherein said molecular system comprises:



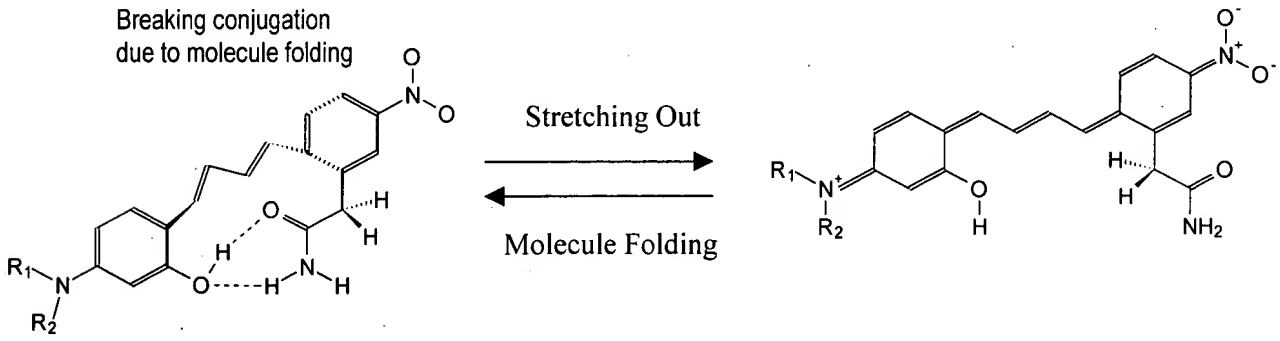
wherein A, B, W, X, Y, and Z are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said

heteroatom and the vertical dashed lines represent electrodes with which said molecular system is electrically associated.

35. (previously presented) The method of Claim 21 wherein said electric field induced band gap change occurs via molecular folding or stretching.

36. (previously presented) The method of Claim 35 wherein said molecular system comprises three portions, a first portion and a third portion, each bonded to a second, central portion, wherein a change from a first state to a second state occurs with an applied electric field, said change involving a folding or stretching about or of said second portion, wherein in said first state, there is extended conjugation throughout said molecular system, resulting in a relatively smaller band gap state, and wherein in said second state, said extended conjugation is changed, resulting in a relatively larger band gap.

37. (previously presented) The method of Claim 36 wherein said molecular system comprises:



wherein R_1 and R_2 are independently selected from the group consisting of hydrogen, heteroatoms, functional groups with at least one said heteroatom, hydrocarbons (either saturated or unsaturated), and hydrocarbons with at least one said heteroatom.

38. (previously presented) The method of Claim 21 comprising a crossed-wire device comprising a pair of crossed wires that form a junction where one wire crosses

another at an angle other than zero degrees and at least one connector species connecting said pair of crossed wires in said junction, said junction having a functional dimension in nanometers, wherein said at least one connector species comprises said molecular system.

39. (previously presented) The method of Claim 38 wherein said crossed-wire device is selected from the group consisting of memories, logic devices, multiplexers, demultiplexers, configurable interconnects for integrated circuits, field-programmable gate arrays (FGPAs), cross-bar switches, and communication devices.

40. (previously presented) The method of Claim 1 wherein said molecular system is sandwiched between a pair of electrodes and connected thereto by linking moieties.